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Cold chain analysis of the fish auction place process in maintaining the quality of fish products in Kali Baru

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ABSTRACT

Fishery commodities are one of the commodities that have not been widely studied in terms of their distribution system. The cold chain system is important in the distribution system for fish products. The purpose of this study was to evaluate the effectiveness of the cold chain system at the trader level at the Kalibaru Barat Fish Landing Place (TPI). Qualitative methods were used in this study, and qualitative data were collected through observation and interviews with fish traders and consumers in traditional markets. The results showed that the West Kalibaru Fish Auction Center is the largest source of fish feed in the Cilincing area. The distribution chain shows that the West Kalibaru Fish Auction Center plays an important role in distributing fish products directly to consumers and fish restaurants. Consumers are highly dependent on Kalibaru Barat Fish Auction Market for their daily food supply. At Kalibaru Barat Fish Auction Market, the cold chain system has not been properly implemented, and the traders at Kalibaru Barat Fish Auction Market have a damaged cold chain system. The importance of fish traders' knowledge and motivation regarding the use of ice to maintain fish quality and freshness, as well as the need to improve the quality of facilities and infrastructure at the fish auction site to increase productivity at the Kalibaru Market, is still very much needed so that traders do not sell on the side of the market or on the sidewalk using tarpaulin roofs.

Keywords : Cold Chain; Supply Chain; Fishery; Fish Auction.

1. INTRODUCTION

Fishery commodities have become a necessity that continues to be needed by society. Fish, as a fishery product used as raw material, is a type of product that is easily damaged (perishable foods). Fishery products are easily damaged, so there is a need for a system to maintain the quality of raw materials. Fishery products as raw materials must maintain their quality so that, in subsequent processing, they can produce good-quality products.

According to the United States Food and Drug Administration (FDA), fish quality involves "freshness, cleanliness, and suitability for consumption of fish." This includes assessing the physical condition, aroma, taste, and appearance of the fish. According to the Institute of Food Technologists (IFT), fish quality includes "taste, aroma, texture, and visual appearance that determine how fish is received by consumers." Determining fish freshness or fish quality involves several components, such as good monitoring of temperature and humidity (Abdullah et al., 2019; Hu et al., 2021). Fish quality is a complex concept involving many different factors, such as safety, nutritional quality, availability, convenience and integrity, freshness, food quality, and physical characteristics apparent in terms of species, size, and type of product (Rahman et al., 2021).

Information regarding handling, processing, and storage techniques, including time and temperature history, which can affect product freshness and quality, is important to partners in the product chain. Additionally, seasonal conditions, the influence of fishing areas and methods, and the presence of various quality defects all affect overall quality. One of the characteristics of fish as a food is that it is a perishable commodity. Therefore, the time elapsed after capture and the "historical" temperature of the fish are often the key factors determining the final quality characteristics of the fishery product.

Figure 1 below describes the distribution flow of fresh fish from fishermen to the end user. Fish collected from fishermen are sold to (1) traders, (3) medium collectors, and (6) big collectors. The medium collectors can sell the product to (1) trader or (5) big collectors. The trader then sells the product to the end user or end consumer. The big collectors can get the product either from fishermen directly or from medium collectors before the products are exported (7). Considering such ways of fish distribution, cold chain systems play a very important role in maintaining the robustness of the fish.

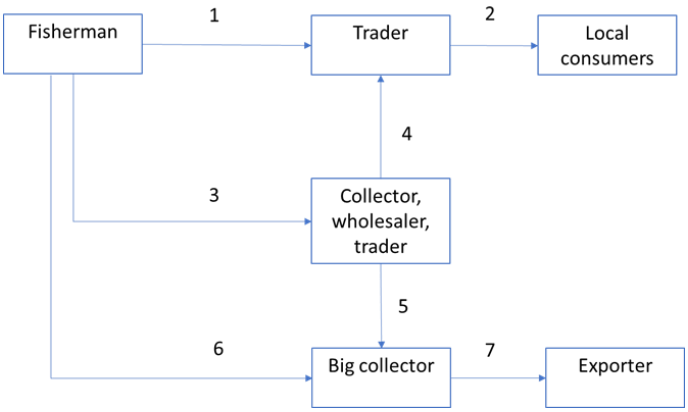

Figure 1. Distribution Patterns and Marketing Channels for Fresh Fish
Source: processed by researchers, 2023

The Cold Chain process plays a crucial role in maintaining the quality of fish products, especially in maintaining the right temperature to prevent bacterial growth and slow product deterioration. The cold chain is a system that keeps frozen or cold products in an environment with a certain temperature during production, storage, transportation, processing, and sales (James & James, 2023).

The cold chain systems comprise integrating transportation and storage activities, without neglecting the sustainability impact, risk mitigation, and customer protection. This theory strongly supports previous research by Mailoa et al. (2020) that one of the fish handling techniques needed to maintain

freshness is the implementation of a cold chain. Maintaining a cold chain system is crucial in post-harvest handling to maintain fish freshness at the time of sale. Emphasized in his research that the important factors that contribute primarily to the organoleptic quality of fish are time and temperature. However, in the context of fish auctions, not much research has been done to analyze and improve the Cold Chain process effectively (Hu et al., 2021).

A study of the quality of fishery products and the implementation of the cold chain system at the Fish auction Kalibaru is necessary to evaluate the effectiveness of the implementation of the cold chain system at the trader level in the market. Field observations show that the way fish is served at stalls does not use ice. To keep fish fresh, use a styrofoam box or a fiber box that has been filled with ice. Problems arise when the fish is placed on display, where the fish is placed in an open area without ice. On the other hand, excessive use of ice cubes means waste, and with the right ratio of fish and ice, it is necessary to pay attention to finding an effective treatment by minimizing the use of cooling media in handling fish. Basically, the cold chain concept refers to a series of steps and processes carried out to maintain the right temperature and ensure the quality of fish products is maintained during transportation and storage.

The conceptual analysis of the cold chain is carried out to identify and understand various factors that can influence fish quality, such as temperature, cleanliness, duration, and storage methods (Turan & Ozturkoglu, 2022). By carrying out conceptual analysis, we can identify weaknesses or obstacles in the cold chain process that can affect the quality of fish products. Furthermore, improvement or optimization steps can be taken to ensure that the quality of the fish is maintained properly throughout the process, from the auction site to the consumers. So, the conceptual analysis in the context of cold chain analysis at fish auction sites aims to ensure that the fish products produced remain fresh and of high quality for consumer satisfaction.

Over the past five years, several studies have been conducted on the implementation of a cold chain system at the West Kalibaru Fish Auction Place (TPI), aimed at maintaining the quality of fish products. A study by Abdullah et al. (2019) highlighted the importance of implementing a cold chain system to maintain fish freshness, as many traders at the West Kalibaru TPI failed to adhere to the required temperature standards, resulting in a decline in fish quality. Furthermore, a study by Hu et al. (2021) analyzed factors influencing fish quality in traditional markets, including the West Kalibaru TPI, and found that temperature and storage time were key factors affecting the organoleptic quality of fish. This study recommended the implementation of a stricter cold chain system to improve product quality.

Furthermore, a study by Wibowo & Anggraeni, (2025) examined the role of local governments in TPI management and cold chain system implementation, finding that government support in providing infrastructure and cooling facilities was crucial for improving fish product quality. A study by Herlambang (2025) also evaluated the quality of fishery products at the West Kalibaru Fish Farm (TPI), showing that inconsistent cold chain implementation leads to product damage and emphasizing the need for training for traders and improved facilities to maintain fish quality. Finally, research by Yang & Lin (2017) discussed cold chain logistics in fresh fish distribution, found that many traders still use inefficient traditional methods, and recommended the implementation of modern technology to improve cold chain efficiency and maintain product quality. Thus, these studies provide valuable insights into the challenges and opportunities in implementing a cold chain system at the West Kalibaru Fish Farm (TPI).

While several studies have examined the cold chain in the fisheries industry, few have specifically analyzed the implementation of the cold chain system at the West Kalibaru Fish Farm (TPI). Previous research has focused primarily on theoretical aspects and failed to provide practical solutions to the challenges faced by traders in the field. Therefore, this study seeks to fill this gap by conducting an in-depth analysis of existing cold chain practices.

This research offers a novel approach by combining conceptual cold chain analysis with practical field evaluation. Using qualitative methods, this study not only identifies problems but also provides recommendations for improving the cold chain system at the West Kalibaru Fish Farm (TPI). This

is expected to improve fish product quality and consumer satisfaction.

The purpose of this study was to evaluate the effectiveness of cold chain system implementation at the trader level at the West Kalibaru Fish Farm (TPI). Therefore, it is hoped that this research will contribute to increasing the productivity and sustainability of the fisheries sector in the region.

2. METHOD

The type of research used in this research is a qualitative method. A qualitative method is a research approach that explores and understands social phenomena or phenomena through in-depth analysis of subjective aspects, complexity, and context, involving participants in their natural situations. A qualitative research method produces in-depth descriptions and interpretations of social phenomena through collecting data in the form of words, images, or objects (Lim, 2025). The research was carried out using descriptive qualitative methods based on the development of basic qualitative test methods using questionnaires and researcher observations of the environment. The questionnaire developed is based on the type of fishery products sold, the cold chain system mechanism used, and the origin of the fishery products. The author conducted questionnaire interviews and observations with traders and buyers who were sellers at TPI Kalibaru.

This qualitative research is interested in analyzing and describing the experiences of individual phenomena in everyday work, which consists of collecting data from interviews, field notes, and official documents. The collected data is processed and explained accordingly. The place for this research was at Fish Auction Kalibaru, DKI Jakarta, and the respondents in this research were fish sellers or traders at Fish Auction Kalibaru. This research lasted approximately 4 months, from July 2023 to October 2023. The data analysis technique used is a type of qualitative descriptive data analysis technique, a research method that utilizes qualitative data and is described descriptively.

The informants in this study were traditional market traders, such as those at the Kalibaru Barat 7 Fish Auction, Muara Baru Fish Auction, Cilincing Fish Auction, Tapekong Fish Auction, and in North Jakarta. The sample respondents from four markets in North Jakarta were taken from 20 stalls. The second respondents were 12 traders at the Kalibaru Barat Fish Auction. The third respondents were a sample of 20 consumers, most of whom always purchase fishery products.

3. RESULTS AND DISCUSSION

3.1 Market Situation Analysis

The traditional market in North Jakarta City is open every day. Based on the results of interviews, it was found that on big days, the market remains open, but stall occupancy tends to decrease. Infrastructure in the form of stalls with minimum standards for fish sellers has been specifically provided by the market management, namely Muara Baru Market, Jakarta Big Market, and Penjaringan Market. The provision of concrete stalls with porcelain coating has not been carried out evenly; this is not by the specifications for fish seller stalls. Things that need to be considered are the type of market that still tends towards semi-outdoor, sanitation and hygiene are not yet practiced, and there is no special room for selling meat. The three things above are deficiencies that must be corrected in the future in developing and improving the quality of the market to fulfill the daily needs of the people of the city of Jakarta. Kalibaru Market, Jalan Baru Market, and Waru Jaya Market have also had some infrastructure built. However, the existence of fish traders has not been fully touched by this infrastructure development, because they still sell on the outskirts of markets or even on sidewalks. The fish traders found were fish traders who used stalls with tarpaulin roofs and used plastic or aluminum buckets to hold the fish. The procurement of both equipment was facilitated by the fish traders themselves.

3.2 Market Trader's Perspective on Cold Chain Systems

Field observations show that the way fish is served at stalls does not use ice. To keep fish fresh, use a styrofoam box or a fiber box that has been filled with ice. Problems arise when the fish is placed on display, where the fish is placed in an open area without ice. On the other hand, excessive use of ice

cubes means waste, and with the right ratio of fish and ice, it is necessary to pay attention to finding an effective treatment by minimizing the use of cooling media in handling fish. Fish asked if ice could be included in the fish container that had been purchased. The experimental results showed that out of 15 fish purchases, 8 traders provided ice, and 7 others did not provide ice. Exploring the reasons for giving ice was carried out by asking directly about the origin of the ice. The trader stated that the ice was in the cool box and a styrofoam box that was brought as a place to store the fish. The fish that were available at the time the research was conducted can be seen in Fish sold in traditional markets as a whole, sold in whole form. Research on the types of fishery products sold to the market shows that the types sold depend on the season. The categories of fish commonly sold in the market are demersal fish, small pelagic fish, and large pelagic fish. The results of research regarding the knowledge and motives of fish traders regarding the importance of using ice to maintain the quality of fish show that fish traders already know for sure about the importance of ice to maintain freshness. Fish, even though it has not been implemented correctly and efficiently. This strongly supports the theory in the discussion put forward by Lestari et al. (2015) that handling fresh fish plays a very important role, because the handling carried out does not mean preventing the rotting process, but maintaining the fish so that it remains fresh by inhibiting the rotting process.

Table 1. Number of Stalls That Provide Commodities in North Jakarta, 2023

Commodities	TPI Kalibaru	TPI Muara Baru	Cilincing Market	TPI Tapekong
Pomfret	3	4	1	1
Gourami	2	3	1	2
Catfish		2	1	
Indigo	1	2		2
Milkfish	2	4	2	2
Cob	2	5	2	3
Tuna	1	3		1
Shrimp	3	5	1	1
Crab		2		
Crab	1	3		2
Squid	2	2	1	2

Source: Processed by Researchers

3.3 Fish Auction Kalibaru Traders' Perspective on the Cold Chain System

The results of the research show that traders at TPI Kalibaru know that the use of ice is necessary to maintain the freshness of fish. This is suspected to be because there is no motive regarding the urgency of using ice by TPI Kalibaru traders. The trader assumes that merchandise in the form of meat must be sold on the same day, where the mobile sales pattern lasts for 3-5 hours. This encourages the behavior of Kalibaru traders not to use ice when selling fish. The use of plastic containers by traders as fish containers for selling also does not allow for the addition of ice. A small number of Kalibaru traders use ice for certain fishery commodities, which are considered to be rapidly deteriorating in quality. The ice provided in plastic containers is obtained from fish traders who buy merchandise. Kalibaru traders as a whole are of the opinion that minimizing the remaining merchandise they bring home, or, under certain conditions, if they bring leftover merchandise, especially meat, they will immediately freeze it in the refrigerator.

3.4 Consumer Perspective on Cold Chain Systems

The research results show that consumers prefer good quality fish by visualizing the entire body of the fish, looking at the condition of the gills, and smell, regardless of the presence of ice in the fish

container. Consumers already know that cold temperatures play an important role in the quality of fishery commodities, so fresh fishery products that have been purchased will immediately be cooled (chiller) or frozen (freezer) in the refrigerator. Research on consumer behavior towards purchasing fish in Turkey shows that almost 50% of respondents pay less attention to the cold chain system used by traders, while consumers pay more attention to the importance of the evisceration process.

Research by Wang et al. (2025) shows that fish quality is significantly influenced by factors such as temperature, humidity, and storage time. These findings align with research by Siddiqui et al. (2024), which emphasizes that temperature and storage time are key to maintaining the organoleptic quality of fish. This suggests that implementing an effective cold chain system can help reduce spoilage and improve product freshness. Research by Grema et al. (2020) revealed that a good fish market must have adequate storage facilities to maintain product quality. These findings support research by Savitri et al. (2019), which emphasizes the importance of government infrastructure support to improve the implementation of cold chain systems at fish processing facilities (TPI). Both indicate that without adequate facilities, fish quality will be compromised.

The research findings indicate the need to improve fish traders' knowledge and awareness of the importance of a cold chain system. Training and outreach on proper fish storage and management techniques can help traders understand the benefits of using ice and appropriate equipment. This study also highlights that the facilities and infrastructure at the West Kalibaru Fish Auction (TPI) still need improvement. Investment in infrastructure, such as better refrigeration and storage facilities, will support the implementation of a more effective cold chain system and increase trader productivity.

Improving fish product quality and distribution efficiency is expected to have a positive impact on traders' incomes, as fresher, higher-quality fish products can attract more consumers, including restaurants, which in turn can increase sales volume. Furthermore, the implementation of a good cold chain system also contributes to the sustainability of fishery resources by reducing post-harvest losses and maintaining fish quality, supporting more sustainable and responsible fishing practices.

The findings of this study can inform policymakers' development of programs to support the development of a cold chain system at fish auction sites. Policies that support training, facilities, and incentives for traders can help improve the fish product distribution system. Overall, this study provides valuable insights into the importance of cold chain systems in maintaining the quality of fish products and provides recommendations that can be implemented to improve distribution practices at TPI Kalibaru Barat.

4. CONCLUSION

Mapping the fisheries value chain in North Jakarta provides an overview of the current conditions of cold chain implementation in the fishing industry. The mapping results can be used to identify the various actors involved, the flow of fishery products, and the main cold chain activities. This identification can be used to find problems with cold chain implementation. Field observations show that the way fish is served at stalls does not use ice. To keep fish fresh, use a styrofoam box or a fiber box that has been filled with ice. Problems arise when the fish is placed on display, where the fish is placed in an open area without ice. On the other hand, excessive use of ice cubes means waste, and with the right ratio of fish and ice, it is necessary to pay attention to finding an effective treatment by minimizing the use of cooling media in handling fish. The research results show that fish traders, both fish traders in the market and Kalibaru, have not implemented the cold chain system effectively, this is due to the accumulation of spoilage processes in the fish distribution chain, which does not use cold chain standards, resulting in the fish's temperature not being properly maintained, accelerating bacterial growth and high levels of heat energy (heat) exposure to the fish.

The knowledge and motives of fish traders regarding the importance of using ice to maintain the quality of fish show that fish traders already know for sure about the importance of ice to maintain freshness and it is still very necessary to improve the quality of the facilities and infrastructure at the fish auction site to increase productivity at Kalibaru Market so that traders do not sell on the edge of

the market or on the sidewalk using tarpaulin roofs.

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